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(71) Applicant: **MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD**
1006, Oaza Kadoma, Kadoma-shi
Osaka 571(JP)

(72) Inventor: **DEKI, Akihito, 2-28-18, Minami Tsukaguchi-cho**
Amagasaki-shi
Hyogo 661(JP)
Inventor: **KASHIMA, Yukiro, 1-7-10-501, Tsukahara**
Takatsuki-shi
Osaka 569(JP)
Inventor: **YOSHIMURA, Hirokazu, 4-55-20, Ankohji-cho**
Takatsuki-shi
Osaka 569(JP)

(74) Representative: **Sorrell, Terence Gordon et al**
Fitzpatricks Europe House World Trade Center
London E1 9AA(GB)

(54) **MICROWAVE CIRCUIT.**

(57) A microwave circuit in which a first metallic case (1, 10), which has on the end face of a cylindrical microwave transmission line a ring-like protruding part (3, 11), is in contact with a second metallic case (4) having a plane-like shape. Since, only in the narrow region of the protruding part (3, 11), it is reliably in contact with the second plane-like metallic case (4), the satisfactory electromagnetic contact between the cases is obtained, and desirable characteristics can be secured.

FIG. 2

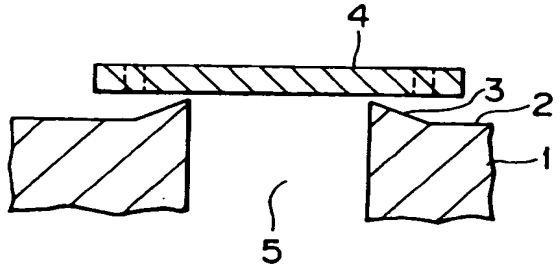

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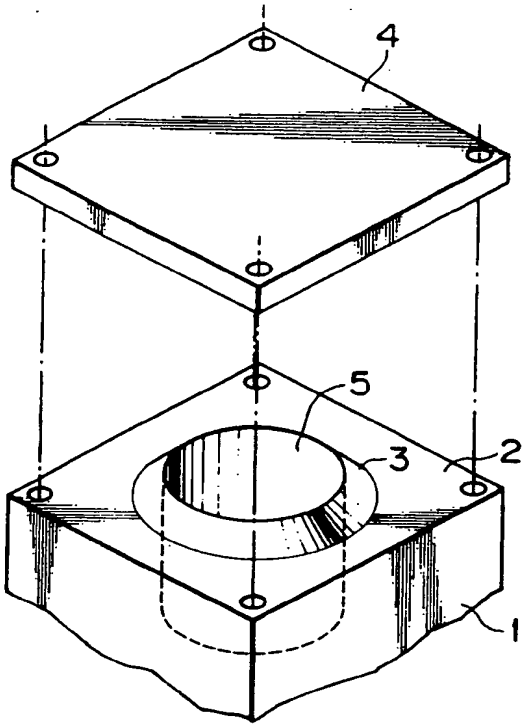
FIG. 1



TECHNICAL FIELD

The present invention relates to a microwave circuit used in a microwave communication apparatus, a satellite broadcast receiving converter or the like.

BACKGROUND ART

Recently, there have been remarkable developments in microwave devices used in microwave communication apparatuses, and it is easy to procure low-noise devices such as HEMT and MESFET, so that the noise factor in reception-type low-noise converters, in particular, is decreasing year after year. However, if the low-noise microwave device itself exhibits a satisfactory noise factor, the loss and impedance mismatching between the input section and the microwave device have a significant influence, making it impossible, in some cases, to obtain a desired noise factor for the low-noise converter as a whole.

Such a conventional microwave circuit will be described with reference to the drawings.

Fig. 7 shows a short-circuit section of a conventional cylindrical waveguide, and Fig. 8 is a sectional view of the same. In Fig. 7, numeral 1 indicates a metal body including a cylindrical waveguide 5, and numeral 2 indicates a mounting surface for a short-circuit plate 4. Usually, the short-circuit plate 4 is fixed to the mounting surface 2 by means of screws or the like to form a short-circuit plane. If the short-circuit plate 4 is in an ideal short-circuit state, a microwave being propagated through the cylindrical waveguide 5 makes a total reflection to change the direction of propagation without involving any loss.

In the above-described construction, however, an adequate contact cannot be attained, in particular, at an end of the cylindrical waveguide due to a variation in the surface precision of the mounting plate 2 and in the flatness of the short-circuit plate 4, with the result that the short-circuit plate 4 does not function as a perfect short-circuit plane. Thus, when using the short-circuit plane of a low-noise converter, the input power cannot be reflected adequately, resulting in deterioration in noise factor and input VSWR.

In view of the above problem, it is an object of the present invention to provide a microwave circuit in which an adequate contact is ensured between a first, external conductor including a cylindrical microwave transmission path and a second conductor having a planar configuration, and which exhibits satisfactory characteristics.

DISCLOSURE OF THE INVENTION

To achieve the above object, the microwave circuit of the present invention comprises: a first metal body having a concentric-circle-like prominence provided at an end of a cylindrical microwave transmission path and extending outwardly from a cylindrical inner wall; and a second metal body having a planar configuration and held in contact with the first metal body.

Due to the above construction of the present invention, the first metal body is held in contact with the second planar metal body solely through a small region corresponding to the prominence provided on the outside of the cylindrical inner wall thereof, thereby attaining an adequate electromagnetic contact between the two metal bodies and ensuring satisfactory characteristics.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view of a short-circuit section of a cylindrical waveguide according to an embodiment of the present invention;

Fig. 2 is sectional view of the same;

Fig. 3 is an exploded perspective view of a short-circuit section of a cylindrical waveguide according to another embodiment of the present invention;

Fig. 4 is a sectional view of the same;

Figs. 5 and 6 are sectional views of cylindrical-waveguide/microstrip-line conversion sections according to second and third embodiments of the present invention;

Fig. 7 is an exploded perspective view of short-circuit section of a conventional cylindrical waveguide; and

Fig. 8 is a sectional view of the same.

BEST MODE FOR CARRYING OUT THE INVENTION

A microwave circuit according to an embodiment of the present invention will now be described with reference to the drawings.

Fig. 1 shows a short-circuit section of a cylindrical waveguide according to the present invention; and Fig. 2 shows a sectional view of the same. In Fig. 1, numeral 1 indicates a metal body including a cylindrical waveguide 5, and numeral 2 indicates a mounting surface for a short-circuit plate 4. If the short-circuit plate 4 is in an adequate short-circuit state, a microwave propagated through the cylindrical waveguide 5 makes a total reflection to change the direction of propagation without involving any loss. In this embodiment, the short-circuit plate 4 is brought into contact with a concentric-circle-like prominence 3 before it is brought into contact with the mounting surface 2 at

the time of mounting, so that the contact of the short-circuit plate 4 with the end surface of the inner-wall section of the cylindrical waveguide 5, which is important when realizing a short-circuit plane, can be attained in an adequate manner, thereby ensuring a satisfactory short-circuit characteristic not depending upon the surface precision of the mounting surface 2. Further, since the short-circuit plate 4 is brought into contact with the inner wall of the cylindrical waveguide 5 before it is brought into contact with the mounting surface 2, it is possible to realize a satisfactory short-circuit plate even if a particularly high level of flatness cannot be ensured for the short-circuit plate 4.

Another embodiment of the present invention will be described with reference to the drawings. Fig. 3 shows a short-circuit section of a cylindrical waveguide according to another embodiment of the present invention, and Fig. 4 shows a sectional view of the same.

In Figs. 3 and 4, numeral 1 indicates a metal body including a cylindrical waveguide 5; numeral 2 indicates a mounting surface for a short-circuit plate; and numeral 3 indicates a concentric-circle-like prominence. In this embodiment, the sectional configuration of the concentric-circle-like prominence 3 is changed so as to facilitate the machining thereof. Like the previous embodiment, this structure is free from the influence of the surface precision of the contact surface 2, and through the contact of the short-circuit plate 4 with the concentric-circle-like prominence 3, it is possible to ensure satisfactory characteristics for the short-circuit plane of the cylindrical waveguide.

Further, second and third embodiments of the present invention will be described with reference to the drawings. Figs. 5 and 6 show a sectional view of cylindrical-waveguide/microstrip-line conversion sections in other embodiments of the present invention.

Numeral 10 indicates a metal body including a cylindrical waveguide; numeral 6 indicates a post member; numeral 7 indicates an MIC substrate having a microstrip line; numeral 8 indicates a metal supporter for forming a hollow coaxial line-together with the post member 6; and numeral 9 indicates a dielectric supporter forming a dielectric coaxial line with the post member 6.

In Figs. 5 and 6, a microwave propagated through the cylindrical waveguide in a direction perpendicular to the plane of the drawings is converted to a coaxial mode in the section of the post member 6 and propagated through coaxial lines formed by the components 9 and 8, and mode conversion is further effected in the connecting section between the MIC substrate 7 and the post member 6 to propagate the microwave through the microstrip line on the MIC substrate 7.

If, in the above waveguide/microstrip-line conversion section, the contact between the metal spacer 8 and the metal body 10 is not adequate, discontinuous portions are present in external conductors in the coaxial lines formed by the metal spacer 8 and the dielectric supporter 9, thereby causing a loss and deterioration in VSWR during microwave propagation. In view of this, a concentric-circle-like prominence 11 is provided on the side of the metal body 10, in the case of Fig. 5, and on the side of the metal support 8, in the case of Fig. 6, thereby an adequate contact is attained in the external conductor sections of the two coaxial lines mentioned above, thus ensuring satisfactory propagating characteristics.

Thus, in accordance with the present invention, a concentric-circle-like prominence is provided on the external conductor forming one coaxial line, and brought into contact with the external conductor of the other coaxial line, thereby preventing loss and deterioration in VSWR due to the generation of discontinuous portions in the coaxial external conductors.

INDUSTRIAL APPLICABILITY

Thus, in accordance with the present invention, a first metal body having a concentric-circle-like prominence at an end of a cylindrical microwave transmission path and extending outwardly from a cylindrical wall is brought into contact with a second metal body having a planar configuration, whereby any discontinuity in the external conductor sections in the microwave transmission path is eliminated and satisfactory transmission characteristics can be obtained, this providing a remarkable advantage.

LIST OF THE COMPONENTS IN THE DRAWINGS

1, 10	metal body
2	mounting surface
3, 11	concentric-circle-like prominence
4	short-circuit plate
5, 12	cylindrical waveguide
6	post member
7	MIC substrate
8	metal supporter
9	dielectric supporter

Claims

1. A microwave circuit comprising: a first metal body whose interior is cut into a cylindrical microwave transmission path and which includes a concentric-circle-like prominence provided at an end of the microwave transmission path and extending outwardly from a cylin-

drical inner wall; and a second metal body which has a planar configuration, said first metal body being held in an adequate contact with said second metal body.

FIG. 1

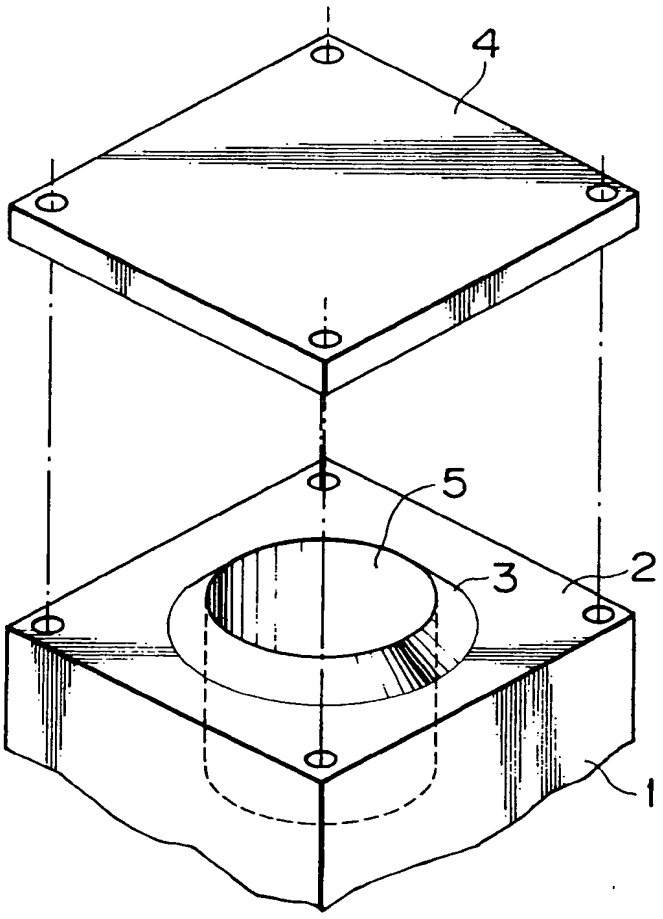


FIG. 2

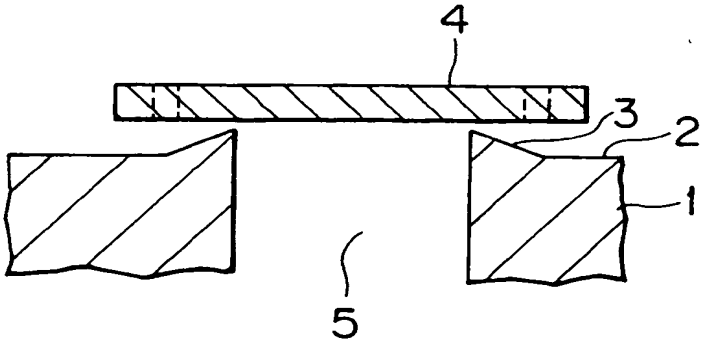


FIG. 3

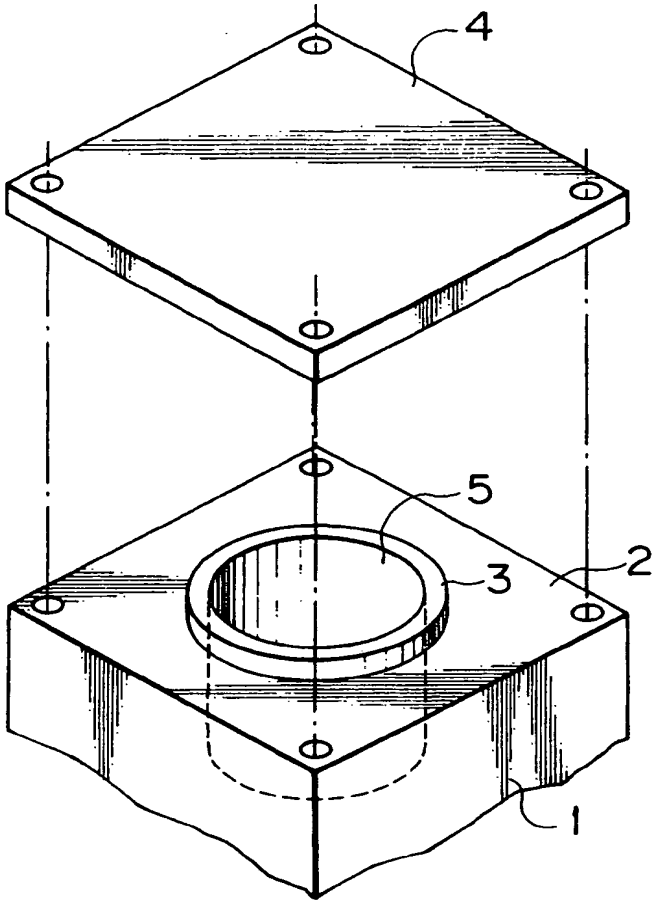


FIG. 4

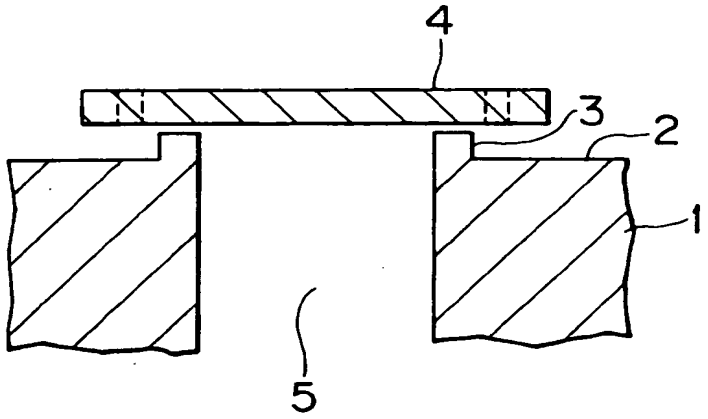


FIG. 5

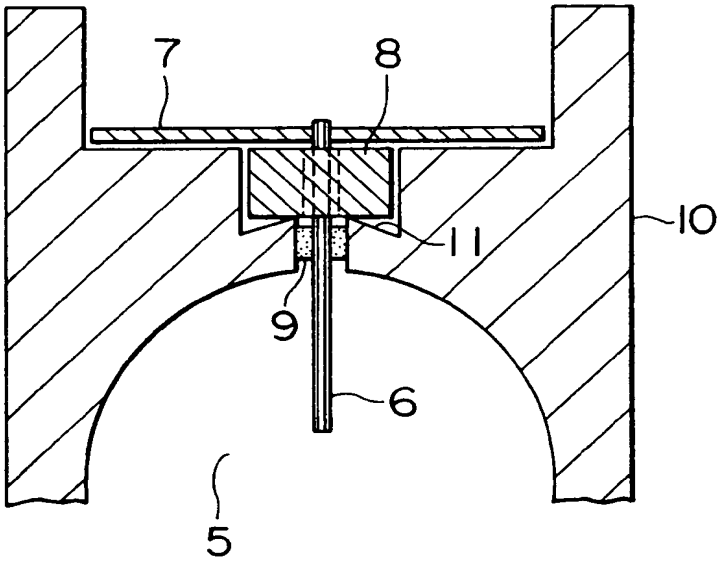


FIG. 6

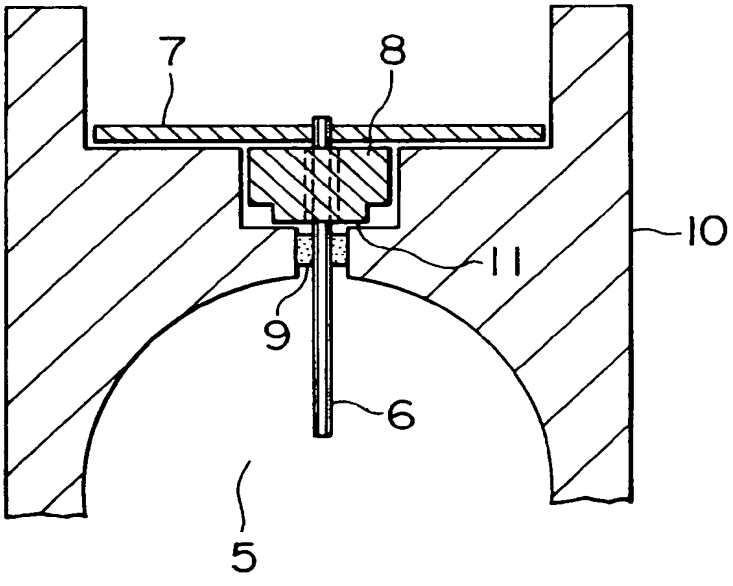


FIG. 7

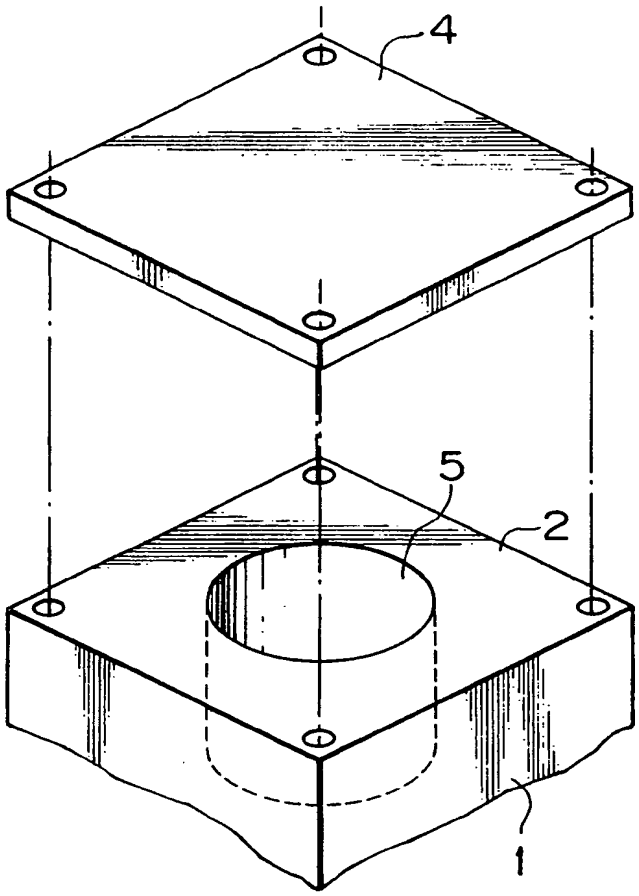
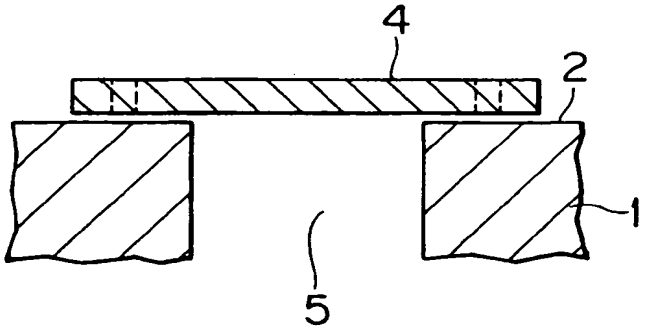


FIG. 8



INTERNATIONAL SEARCH REPORT

International Application No PCT/JP91/01171

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl^5 H01P1/24, H01P5/107

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System	Classification Symbols
IPC	H01P1/24, H01P5/107, H01P1/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *

Jitsuyo Shinan Koho	1950 - 1991
Kokai Jitsuyo Shinan Koho	1971 - 1991

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
Y	JP, A, 2-183601 (Masupuro Denko K.K.), July 18, 1990 (18. 07. 90), Line 15, lower right column, page 1 to line 12, upper left column, page 2, line 10, lower left column, page 2 to line 9, upper left column, page 3, line 13, lower left column to line 19, lower left column, page 3 (Family: none)	1
Y	JP, U, 62-21601 (NEC Corp.), February 9, 1987 (09. 02. 87), Claim, Fig. 1 (Family: none)	1

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
October 15, 1991 (15. 10. 91)	November 5, 1991 (05. 11. 91)

International Searching Authority	Signature of Authorized Officer
Japanese Patent Office	

Form PCT/ISA/210 (second sheet) (January 1985)